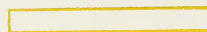


An important
message for
people who
employ survey
techniques:



Cut survey time,
improve accuracy
with DIET

DIET

DATA INVESTIGATOR AND ENGLISH TRANSLATOR is a unique programming technique that enables an electronic computer to sift and analyze the masses of data accumulated from survey questionnaires, search for meaningful trends and patterns, then print out the results directly in the form of English sentences.

SOME NOTES ABOUT A REMARKABLE NEW RESEARCH TOOL

DIET..... is a new research technique that provides the user with highly intelligible English language reports directly as computer output. These reports clearly and concisely highlight significant patterns, or trends, present within the data being explored. These trends are reported only after every combinatorial relationship among the input variables has been exhaustively tested.

DIET..... uses as input the answers to a questionnaire. Each question can be considered an "attribute" of the respondent. Thus in the hypothetical questionnaire depicted on these pages, average distance of flight, number of flights per year, and class of service are all attributes measured by the questionnaire.

DIET..... is capable of forming "characteristics" of the respondents based upon their attributes. Two or more attributes are combined to form a characteristic. The researcher may be interested, for example, in respondents who fly first class fifteen or more times a year. Here the attributes "class of service" and "number of flights per year" were combined to form the characteristic.

DIET..... provides meaningful reports to the researcher in declarative English sentences similar to those shown on the accompanying output record. These sentences are composed of a subject, a verb, and an object. The subjects and objects appearing in the sentences are derived from the actual questions of the study. The subjects can be either a preselected subset or all the questions that are present in the study. This depends upon whether the researcher wishes to find out patterns about particular subjects or wishes to examine all possibilities for significant patterns. The objects are normally all the questions of the study, but can also be limited to a subset if desired.

DIET..... chooses the verb of each sentence most uniquely. Based upon the value of the statistical measure of the degree of association or fit, a verb corresponding to that particular value is selected and printed. Both the wording of the verb and its corresponding values are controlled by the user.

DIET..... can also select and list the individual members (respondents) of a group conforming to any given set of characteristics. Thus, it serves as an information retrieval system. If hospital records of blood donors contained each donor's blood type and home address for example, people possessing a rare blood type within a selected region of the metropolitan area could be easily identified in an emergency.

DIET..... has been used in many studies in addition to that upon which we have based our example. Examination of dietary and environmental links to certain pathologies; determination of default patterns among credit applicants; and analysis of consumer response to commercial goods and services on the basis of numerous demographic attributes are some applications of interest.

INFLIGHT ENTERTAINMENT ATTITUDE SURVEY

(This survey is hypothetical, and is used to illustrate how the DIET system may be used in questionnaire analysis)

1. Approximately how many times a year do you fly?
a] Less than 5 ☐ b] 5-10 ☐ c] 11-15 ☐ d] over 15 ☐

2. Are your flights primarily for
a] Business? ☐ b] Non-business? ☐

3. What is the average length of your flights?
a] Less than 200 miles ☐ b] 200-400 miles ☐ c] 400-600 miles ☐ d] over 600 miles ☐

4. Do you usually fly
a] Coach? ☐ b] First class? ☐

5. Do you generally
a] Fly alone? ☐ b] Fly with friends or family? ☐

6. What is your approximate income level?
a] Below \$5,000 ☐ b] 5-10,000 ☐ c] 10-15,000 ☐ d] over 15,000 ☐

7. What is your age?
a] Below 25 ☐ b] 26-35 ☐ c] 36-45 ☐ d] over 45 ☐

8. My sex is
a] Male ☐ b] Female ☐

How often do you do each of the following while flying?

	<u>Never</u>	<u>Almost Never</u>	<u>Sometimes</u>	<u>Often</u>	<u>Always</u>
9. Read Newspapers	☐	☐	☐	☐	☐
10. Read Magazines	☐	☐	☐	☐	☐
11. Read Books	☐	☐	☐	☐	☐
12. Do Business Work	☐	☐	☐	☐	☐
13. Sleep	☐	☐	☐	☐	☐
14. Have Conversations with other passengers	☐	☐	☐	☐	☐

How often would you use the following if they were available?

	<u>Never</u>	<u>Almost Never</u>	<u>Sometimes</u>	<u>Often</u>	<u>Always</u>
15. Television	☐	☐	☐	☐	☐
16. Movies	☐	☐	☐	☐	☐
17. F.M. Radio	☐	☐	☐	☐	☐
18. A.M. Radio	☐	☐	☐	☐	☐

Would you change flights if another airline offered the same schedule and cost but had

<u>For Business Flights</u>			<u>For Non-Business Flights</u>		
<u>Yes</u>	<u>No</u>	<u>Uncertain</u>	<u>Yes</u>	<u>No</u>	<u>Uncertain</u>
19. Television	☐	☐	23. ☐	☐	☐
20. Movies	☐	☐	24. ☐	☐	☐
21. F.M. Radio	☐	☐	25. ☐	☐	☐
22. A.M. Radio	☐	☐	26. ☐	☐	☐

Would you be willing to take a less convenient flight if it had

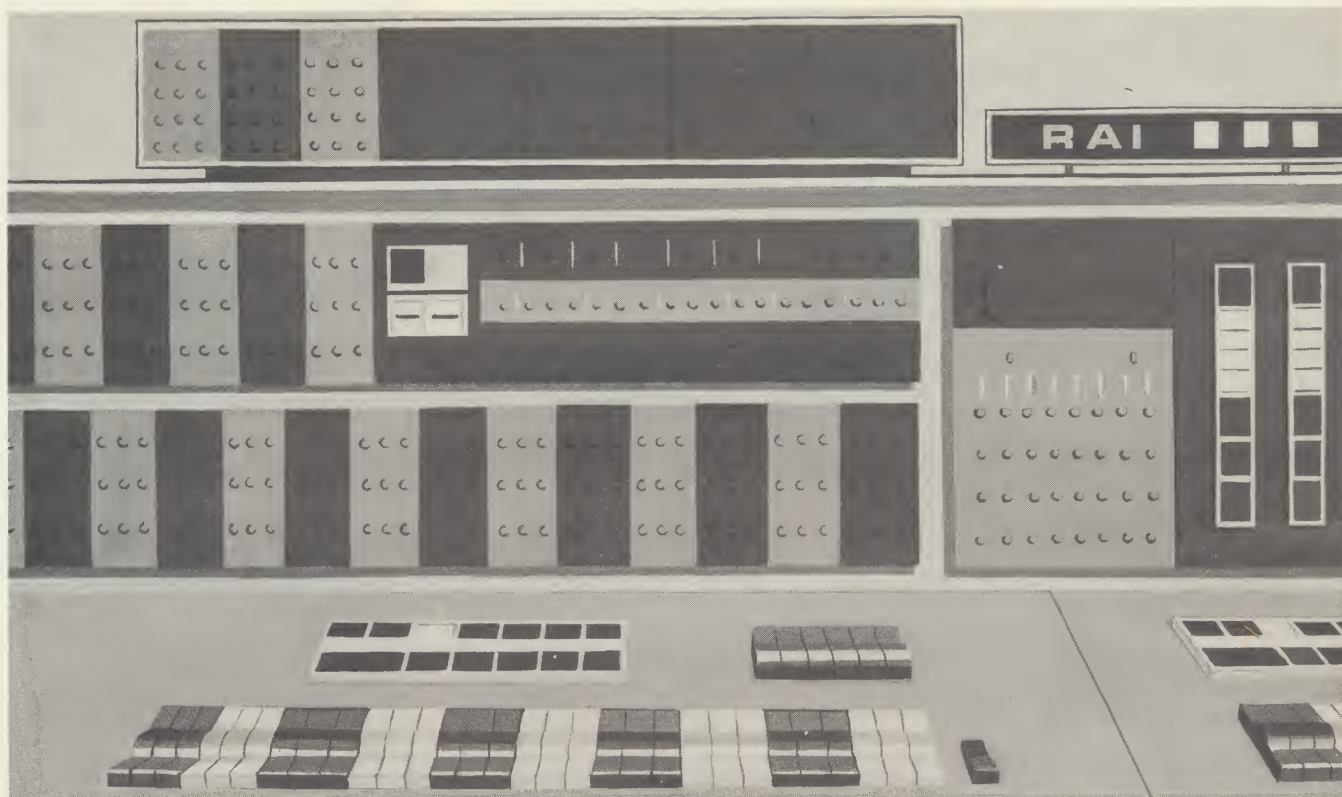
<u>For Business Flights</u>			<u>For Non-Business Flights</u>		
<u>Yes</u>	<u>No</u>	<u>Uncertain</u>	<u>Yes</u>	<u>No</u>	<u>Uncertain</u>
27. Television	☐	☐	31. ☐	☐	☐
28. Movies	☐	☐	32. ☐	☐	☐
29. F.M. Radio	☐	☐	33. ☐	☐	☐
30. A.M. Radio	☐	☐	34. ☐	☐	☐

Would you be willing to take a more expensive flight if it had

<u>For Business Flights</u>			<u>For Non-Business Flights</u>		
<u>Yes</u>	<u>No</u>	<u>Uncertain</u>	<u>Yes</u>	<u>No</u>	<u>Uncertain</u>
35. Television	☐	☐	39. ☐	☐	☐
36. Movies	☐	☐	40. ☐	☐	☐
37. F.M. Radio	☐	☐	41. ☐	☐	☐
38. A.M. Radio	☐	☐	42. ☐	☐	☐

DIET

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ANNOUNCING

THE RESEARCH APPLICATIONS LIBRARY

OF COMPUTER PROGRAMS

A comprehensive library of computer programs is now available to users of RAI's IBM Computer Facilities at no additional cost. (See the current Applications Library Bulletin for a detailed list of available programs).

Research Applications Inc. is a company dedicated to fostering a greater usage of electronic data processing services for the solution of management and research problems. RAI believes that this marriage of Computers

and a versatile Program Library opens the doors of rapid, accurate, and inexpensive computer solutions to all. No longer is the computer a tool useful only to those who can afford costly programming and operating staffs.

The most economical way to achieve solutions to your research projects is to send RAI your data and control cards keypunched. (The directions appearing in the program writeup will give you explicit instructions.) However, if you so desire RAI will key-punch your data and control cards, at additional cost.

After RAI has processed your data you will receive the printed output containing the solution. Prompt delivery of both your output and the original input is assured. And the nicest part of this plan is that you pay only for the machine time used.

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ANNOUNCING RAI'S MONTHLY EDP NEWSLETTER

With this issue, Research Applications, Inc. inaugurates a new monthly series designed to outline activities within our company and the data processing industry.

Each month the lead article will highlight a management research technique that has been developed for computer application. Unusual contracts that we are working on, profiles of our key personnel, and important industry developments will complete the publication.

This newsletter is designed to communicate ideas. Your ideas are equally of interest and our readers are earnestly invited to send us their comments and contributions.

DIET – A BREAKTHROUGH IN QUESTIONNAIRE ANALYSIS

*New Survey Analysis Tool . . . Exhaustive Analysis . . .
Selects Only Significant Relationships . . . Reports in English
For Management's Immediate Understanding . . .*

DIET (Data Investigator and English Translator) is a unique programming technique developed by RAI. This system enables an electronic computer to sift and analyze the masses of data accumulated from survey questionnaires, search for meaningful trends and patterns, and then print out the result directly in the form of English sentences. Computers can make programmed decisions and can digest uncanny amounts of information, but the normal mode of computer output is rarely intelligible to the average managerial person. The DIET system takes advantage of the first two computer capabilities, and innovates an output medium that satisfies the major reporting deficiency.

NEW POWER FOR SURVEY ANALYSIS

Even when computers are used to process survey data, it takes analysts many hours to examine the results. Furthermore, they are only examining selected hypotheses, due to the astronomical number of cross-tabulation combinations. The DIET system relieves the analyst from this time consuming process, and gives him more power by exhaustively searching all relationships and reporting only those that are significant. And, as a further advantage, the computer output is in the form of an English report, not a series of unintelligible tables. By merely scanning this report, management will be able to extract a succinct profile of relationships — in the language of management — prose, not numbers!



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THE GIST OF SURVEY ANALYSIS

The basic question that is to be answered by survey analysis is:

How do certain groups of people differ in their behavior or characteristics?

Some typical questions that a survey might seek to answer are:

What are the differences between men and women in their attitudes towards sports cars?

Is there a difference of productivity between work groups that have high morale and those that have low morale?

In each of the above illustrations we must classify our sample into two groups, e.g.

Men	Women
High Morale Groups	Low Morale Groups

We then proceed to compute the responses of each group to the questions asked, and attempt to identify those items that have different response patterns between the two groups.

A more sophisticated question that an analyst might ask is:

Are there any differences in political behavior between Irish Catholic low income groups and Irish Catholic high income groups?

In this instance, our groups are determined by a combination of attributes, not merely one. To construct our groups we must examine the ethnic, religion, and income questions and find those people who satisfy our criteria. When the subject groups have been determined, we then proceed to analyze their responses in the manner mentioned above.

HOW THE SYSTEM WORKS

DIET uses as input the answers to a questionnaire. Subject groups are then developed by logical combinations of the basic questions. For example, a subject group could be developed for managers who have over ten years experience and earn more than \$20,000.00. Here the questions—occupation, experience, and income—are examined to select the subject groups.

Each question is then dichotomized (i.e., classified into one of two categories). This classification may be performed in many ways. For some questions, above-below the mean splits would be desired; for others, discrete categories would be required. An example of the former might be:

Category 1 — Those who earn less than \$8,000.00.

Category 2 — Those who earn more than \$8,000.00.

A discrete split might be:

Category 1 — Users of electric shavers.

Category 2 — Non users of electric shavers.

Other types of dichotomies that can be produced include:

Each choice against all other choices.

Two or more specific choices versus the remainder.

Above-below arbitrary point in scale.

Each choice against any other choice.

For each of the subject groups chosen, a cross-tabulation is performed against every question:

TABLE I

Q. 1. Do You Usually Fly Coach Or First Class?

	Coach	First Class
Subject Group I Passengers whose average flight is less than 400 miles	63	12
Subject Group II Passengers whose average flight is more than 400 miles	18	34

TABLE II

Q. 2. Approximately How Many Times A Year Do You Fly?

	Fly Less Than Five Times a Year	Fly More Than 10 Times a Year
Subject Group I Passengers whose average flight is less than 400 miles	7	89
Subject Group II Passengers whose average flight is more than 400 miles	12	13

Table I indicates that 63 people in Subject Group I fly coach and 12 fly first class. Similarly, in Subject Group II, 18 people fly coach and 34 fly first class.

Each of these 2 x 2 tables are then subjected to a test of significance (chi-square, Fisher P, etc.). If the test is significant at the desired level, an English sentence is outputted describing the relationship.

These sentences are composed of a subject, a verb, and an object. The subject describes the criterion group and the object defines the nature of the relationship. The verb is chosen most uniquely. Based upon the value of the statistical measure of the degree of association or fit, a verb corresponding to that particular value is selected and presented. Both the wording of the verb and its corresponding values are controlled by the user.

A sample computer output for the DIET system is presented on the following page.

SAMPLE DIET OUTPUT

1. PASSENGERS WHO GENERALLY FLY FOR BUSINESS PURPOSES (simple subject)			
LEAN TOWARD BEING (verb indicating 80% association)	33	12	Q. 4
PASSENGERS WHO GENERALLY FLY COACH (nature of relationship)	35	16	CHI. SQ. is 4.96 (measure of significance)
* * * * *			
ARE MOSTLY (verb indicating 90% association)	7	89	Q. 19
PEOPLE WHO FLY ALONE	12	13	CHI. SQ. is 54.82
* * * * *			
ARE ALWAYS	0	80	Q. 30
PEOPLE WHO WOULD NOT BE WILLING TO TAKE A LESS CONVENIENT FLIGHT IF THEY SHOWED MOVIES	2	47	CHI. SQ. is 20.69
47. PASSENGERS WHO FLY MORE THAN 15 TIMES A YEAR AND GENERALLY FLY FIRST CLASS (compound subject)			
TEND TO BE	19	30	Q. 3
THOSE WHOSE AVERAGE FLIGHT IS MORE THAN 400 MILES	53	29	CHI. SQ. is 32.95
* * * * *			
TILT TOWARD BEING	13	37	Q. 6
FROM FAMILIES WHOSE HOUSEHOLD INCOME IS ABOVE \$10,000	25	51	CHI. SQ. is 9.26
* * * * *			
LEAN TOWARD BEING	40	8	Q. 12
PASSENGERS WHO NEVER OR ALMOST NEVER DO BUSINESS WORK WHILE IN FLIGHT	15	63	CHI. SQ. is 79.09
* * * * *			
TILT TOWARD BEING	29	11	Q. 20
PASSENGERS WHO WOULD NOT BE WILLING TO TAKE A LESS CONVENIENT FLIGHT IF IT HAD F.M. RADIO	35	10	CHI. SQ. is 5.19
* * * * *			
ARE MOSTLY	3	47	Q. 30
PASSENGERS WHO WOULD CHANGE FROM THEIR USUAL AIRLINE TO ONE THAT HAD MOVIES WHEN TAKING BUSINESS TRIPS	0	80	CHI. SQ. is 20.69

APPLICATION: The DIET system can be effectively used on any questionnaire design. It has particular value as an exploratory tool to direct attention to profitable areas of analysis. Some selected areas of successful application include:

- Examination of dietary and environmental links to certain pathologies.
- Determination of default patterns among credit applicants.
- Analysis of consumer response to commercial goods on the basis of numerous demographic attributes.

SELECTED RECENT RAI PROJECTS

IBM 360 PROGRAM TESTING

RAI's staff of program analysts and statisticians have recently completed the acceptance testing for the IBM 360 STATPAC system. STATPAC is a scientific subroutine package of over thirty Fortran statistical subroutines. These routines are input/output free, computational building blocks that may be combined to perform most statistical solutions. Both parametric and non-parametric techniques were included in this package.

SYSTEMS DESIGN FOR TRANSIT AUTHORITY

RAI is currently working with the Transit Authority as part of a systems team to develop computerized techniques for control and reporting requirements. RAI has been involved in the development of:

- a retrieval system for crime statistics.
- a computerized model to deploy transit policemen to their scheduled posts.
- a policemen profile data bank.

LAW RETRIEVAL SYSTEM

RAI has developed several computers programs for Law Research, Inc. One in particular is a law case information search and print. If a client requires information pertaining to a point of law (i.e. contracts, damages, etc.), a simple inquiry will produce a printed report of law case references and sources. The information file contains approximately 200,000 law cases which relate to 20 different points of law.

STATISTICAL ANALYSIS FOR METALLURGICAL RESEARCH

RAI has assisted the American Brake Shoe Research Center in designing a series of statistical experiments to determine the performance characteristics of certain alloys. These experiments were analyzed using our Multiple Regression and Discriminant Analysis computer programs. In addition, RAI developed a prediction program for American Brake Shoe and provided a seminar in regression techniques to the staff at the Research Center.

SYSTEMS DEVELOPMENT FOR IBM MANUFACTURING DIVISION

RAI has provided, on a full time basis for the past eight months, a mathematical program analyst to assist the IBM manufacturing division in the development of a linear programming system. This system, given the inventory of computer components by machine type, can develop the parts and time requirements for manufacturing and output the optimum mixes of computer types to be produced.

CONSUMER ANALYSIS OF SURVEY DATA

RAI, working with the research staff of Motivational Programmers, Inc. has developed over 20 models of consumer behavior. These statistical models were constructed through the use of the following multivariate techniques: Correlation Analysis, step-wise Regression Analysis and Multiple Discriminant Analysis.

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